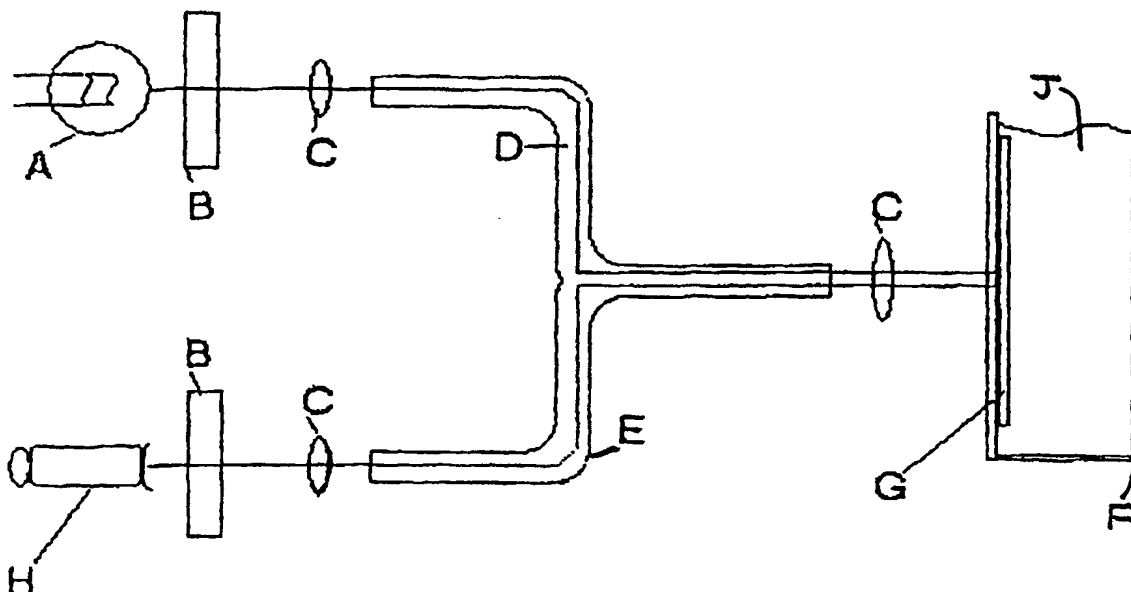


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : G01N 21/55		A1	(11) International Publication Number: WO 00/58714
			(43) International Publication Date: 5 October 2000 (05.10.00)
(21) International Application Number: PCT/GB00/01161 (22) International Filing Date: 27 March 2000 (27.03.00) (30) Priority Data: 9906949.4 26 March 1999 (26.03.99) GB (71) Applicants (for all designated States except US): CRANFIELD UNIVERSITY [GB/GB]; Cranfield, Bedfordshire MK43 0AL (GB). THE NATIONAL GRID COMPANY PLC [GB/GB]; Technology and Science Division, Kelvin Avenue, Leatherhead, Surrey KT22 7ST (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): RITCHIE, Lawrence [GB/GB]; 101 Waterside, Peartree Bridge, Milton Keynes MK6 3DF (GB). FERGUSON, Clive, Patrick [GB/GB]; 7 Sundridge Avenue, Welling, Kent DA16 2SR (GB). SAINI, Selwayan [GB/GB]; 16 Sandhill Close, Millbrook, Bedfordshire MK43 0AL (GB). (74) Agents: STUART, Ian et al.; Mewburn Ellis, York House, 23 Kingsway, London WC2B 6HP (GB).		(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>	

(54) Title: DETECTION OF LIQUIDS



(57) Abstract

Liquid, particularly leaked oil or other hydrophobic liquid, is detected by a sensor. This preferably has a hydrophobic membrane (G) that takes up the oil selectively, a radiation source (A) that beams radiation at an interface between the membrane (G) and a window (F), and a radiation detector (H) that receives radiation resulting from interaction (such as reflection, scattering or fluorescence) of the input radiation with the liquid-containing membrane (G). The detector may employ a spectrofluorimeter (H) whose output can be used to characterise the liquid.

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EE	Estonia	LR	Liberia	SG	Singapore		

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference IS/BP5842513	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 01161	International filing date (day/month/year) 27/03/2000	(Earliest) Priority Date (day/month/year) 26/03/1999
Applicant CRANFIELD UNIVERSITY et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of Invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

11

☐ None of the figures.

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G01N21/55

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 282 009 A (SOUNDEK OY) 14 September 1988 (1988-09-14) claims 1,2; figures	1,2,5, 10,12,17
Y	---	6-9,14
X	US 5 831 743 A (RAMOS ROGERIO TADEU ET AL) 3 November 1998 (1998-11-03) column 8, line 47 - line 59 column 16, line 4 - line 22 ---	1,2,10, 12,17
X	EP 0 598 341 A (HOECHST AG) 25 May 1994 (1994-05-25) page 4, line 43 - line 57 page 9, line 35 - line 42 figures 1,7 ---	1,5
	--- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

23 June 2000

Date of mailing of the international search report

29/06/2000

Name and mailing address of the ISA

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 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Krametz, E

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 159 420 A (TSUNODA AKIYOSHI) 26 June 1979 (1979-06-26) column 4, line 63 -column 5, line 58 figure 4 ---	1,10
Y	GB 2 234 061 A (ATOMIC ENERGY AUTHORITY UK ;BRITISH NUCLEAR FUELS PLC (GB)) 23 January 1991 (1991-01-23) claim 1 ---	6,7
Y	US 4 609 821 A (SUMMERS CHARLES F) 2 September 1986 (1986-09-02) column 2, line 19 - line 34 column 6, line 37 - line 56 figure 6 ---	8,9,14
A	EP 0 505 581 A (ISHIKAWAJIMA HARIMA HEAVY IND ;NIPPON CATALYTIC CHEM IND (JP)) 30 September 1992 (1992-09-30) page 3, line 9 -page 4, line 18 claim 1 -----	1,3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/01161

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0282009	A	14-09-1988	FI 871042 A	11-09-1988
			JP 63252241 A	19-10-1988
			NO 880954 A	12-09-1988
			US 4882499 A	21-11-1989
US 5831743	A	03-11-1998	WO 9605499 A	22-02-1996
			GB 2292216 A,B	14-02-1996
			NO 970522 A	04-04-1997
EP 0598341	A	25-05-1994	DE 69321191 D	29-10-1998
			DE 69321191 T	29-04-1999
			JP 3001357 B	24-01-2000
			JP 6222006 A	12-08-1994
			US 5563707 A	08-10-1996
US 4159420	A	26-06-1979	JP 53076889 A	07-07-1978
GB 2234061	A	23-01-1991	NONE	
US 4609821	A	02-09-1986	GB 2142955 A,B	30-01-1985
			AU 2791584 A	10-01-1985
			BR 8402408 A	02-04-1985
			CA 1221847 A	19-05-1987
			DE 3418587 A	17-01-1985
			DK 254584 A	07-01-1985
			ES 533312 D	01-06-1985
			ES 8505788 A	01-10-1985
			FR 2556465 A	14-06-1985
			IE 55558 B	24-10-1990
			IT 1212099 B	08-11-1989
			NL 8401584 A	01-02-1985
			NO 841846 A	07-01-1985
			SE 8402695 A	07-01-1985
EP 0505581	A	30-09-1992	JP 4149042 A	22-05-1992
			WO 9206932 A	30-04-1992

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 00/ 01161

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The abstract is changed as follows :


line 4 : replace "(A,B,C,D,C)" with "(A)" ;
line 6 : replace "(C,E,C,B,H)" with "(H)".

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference IS/BP5842513	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/01161	International filing date (<i>day/month/year</i>) 27/03/2000	Priority date (<i>day/month/year</i>) 26/03/1999
International Patent Classification (IPC) or national classification and IPC G01N21/55		
Applicant CRANFIELD UNIVERSITY et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none">I <input checked="" type="checkbox"/> Basis of the reportII <input type="checkbox"/> PriorityIII <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicabilityIV <input type="checkbox"/> Lack of unity of inventionV <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statementVI <input type="checkbox"/> Certain documents citedVII <input type="checkbox"/> Certain defects in the international applicationVIII <input checked="" type="checkbox"/> Certain observations on the international application		
Date of submission of the demand 25/10/2000	Date of completion of this report 03.07.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Purdie, D Telephone No. +49 89 2399 2187	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/01161

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-16 as originally filed

Claims, No.:

1-18 as originally filed

Drawings, sheets:

1/7-7/7 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/01161

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims 4, 7, 9, 11, 13, 14, 16, 18
	No:	Claims 1-3, 5, 6, 8, 10, 12, 15, 17
Inventive step (IS)	Yes:	Claims
	No:	Claims 1-18
Industrial applicability (IA)	Yes:	Claims 1-18
	No:	Claims

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet